

MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
Bldg. 202 RM 211
Gaithersburg, Maryland 20899

SRM Number: 1621e
MSDS Number: 1621e
SRM Name: Sulfur in Residual Fuel Oil
Date of Issue: 9 September 1999

MSDS Coordinator: Joylene W.L. Thomas
Phone: (301) 975-6776
ChemTrec: 1-800-424-9300

FAX: (301) 926-4751
E-mail: SRMMSDS@nist.gov

SECTION I. MATERIAL IDENTIFICATION

Material Name: Sulfur in Residual Fuel Oil

Description: A high viscosity residual oil. A mixture of petroleum hydrocarbons (paraffinic, olefinic, naphthenic and aromatic). A fuel oil of low sulfur content.

Other Designations: Sulfur (brimstone, sulphur) in Fuel Oil No. 6

Name	Chemical Formula	CAS Registration Number
Sulfur in Residual Fuel Oil	complex mixture	68553-00-4

DOT Classification: Not regulated by DOT.

Manufacturer/Supplier: Available from a number of suppliers.

NOTE: This material contains a nominal sulfur concentration of less than 1.0 %. For the actual certified concentration, refer to the corresponding Certificate of Analysis.

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Component	Nominal Concentration	Exposure Limits and Toxicity Data
Residual Fuel Oil No. 6	~ 99	OSHA TLV-TWA: 5 mg/m ³ (mineral oil mist)
		Rat, Oral: LD ₅₀ : 5.1 g/kg
		Rabbit, Skin Irritation: 500 mg
		Rabbit, Skin LD ₅₀ : >5 mL/kg

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Residual Fuel Oil No. 6	
Appearance and Odor: A black liquid to heavy paste with a petroleum odor.	Kinematic Viscosity (@ 40 °C): 80.76 x 10 ⁻⁵ m ² /s (807.6 cSt)*
Density (@ 15 °C): 1005.1 kg/m ³ *	Kinematic Viscosity (@ 50 °C): 37.07 x 10 ⁻⁵ m ² /s (370.7 cSt)*
Boiling Point: > 260 °C	Kinematic Viscosity (@ 100 °C): 3.31 x 10 ⁻⁵ m ² /s (33.1 cSt)*
Pour Point: 1.7 °C*	Heat of Combustion: 42.37 MJ/kg (18 214 Btu/lb)*
	Water Solubility: Negligible

*Values obtained from physical tests and measurements of SRM 1621e. The analyses were performed using ASTM methods by a commercial firm under contract to the National Institute of Standards and Technology.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: 62 °C***Method Used:** PMCC***Autoignition Temperature:** 407.22 °C**Flammability Limits in Air (Volume %):**
UPPER: 20.1
LOWER: 3.9

Extinguishing Media: Use a dry chemical powder, carbon dioxide, or foam. Use a water spray to cool fire exposed containers only. Do not use a forced water stream directly into an oil fire as this will only scatter the fire; use a smothering technique for extinguishing the fire of this combustible material.

Unusual Fire and Explosion Hazards: Heating this material greatly increases the fire hazard. Thermal oxidative degradation may yield various hydrocarbons and hydrocarbon derivatives: CO₂, CO, and SO₂.

Special Fire Procedures: Fuel Oil No. 6 is an OSHA Class IIIA combustible liquid. Firefighters should wear self-contained breathing apparatus and full protective clothing.

*Values obtained from physical tests and measurements of SRM 1621e. The analyses were performed using ASTM methods by a commercial firm under contract to the National Institute of Standards and Technology.

SECTION V. REACTIVITY DATA

Stability: X Stable Unstable

Conditions to Avoid: Avoid heat, flames, and sources of ignition.

Incompatibility (Materials to Avoid): Keep this fuel oil from strong oxidizing agents.

Hazardous Decomposition or Byproducts: Various hydrocarbons and hydrocarbon derivatives can be produced. See Section IV: *Fire and Explosion Hazard Data*.

Hazardous Polymerization: Will Occur X Will Not Occur

SECTION VI. HEALTH HAZARD DATA

Route of Entry: X Inhalation X Skin X Ingestion

Health Hazards (Acute and Chronic): Inhalation of excessive concentrations of the vapor or mist can be irritating to the respiratory passages. Prolonged or repeated skin contact may cause irritation of the hair follicles and block the sebaceous glands. This produces a rash of acne pimples and spots usually on the arms and legs. Good personal hygiene will prevent this. Heavy, repeated application of Fuel Oil No. 6 to rabbit skin gave severe skin changes and toxicity.

Chemical pneumonitis may result when ingestion occurs and oil is aspirated into the lungs.

Signs and Symptoms of Exposure: Headache, vomiting, nausea, dizziness, and loss of coordination along with skin irritation and pimples are indicative of exposure.

Medical Conditions Generally Aggravated by Exposure: Acne and dermatitis.

Listed as a Carcinogen/Potential Carcinogen:*

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<u> X </u>	
In the International Agency for Research on Cancer (IARC) Monograph	<u> X* </u>	
By the Occupational Safety and Health Administration (OSHA)		<u> X </u>

NOTE: Low benzene levels reduces carcinogenic risk. Fuel oils are exempted for benzene carcinogenic potential under 29 CFR 1910.1028.

*The IARC lists residual (heavy) fuel oils, as Group 2B: possibly carcinogenic to humans.

EMERGENCY AND FIRST AID PROCEDURES :

Skin Contact: Remove contaminated shoes and clothing. Wipe excess oil off with a dry cloth. Wash affected area well with soap and water. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance immediately.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

TARGET ORGAN(S) OF ATTACK: The skin, eyes, and upper respiratory tract.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released: Notify safety personnel of leaks and spills. Remove sources of heat or ignition and provide adequate ventilation. Personnel performing the clean-up should use protection against contact with the liquid and vapor or mist inhalation. Contain spill by diking. Small spills can be contained by absorbents, such as rags, straw, polyurethane foam, activated carbon and sand. Clean up spills promptly to reduce fire or vapor hazards. Large oil spills must be reported to the authorities.

Waste Disposal: The material may be disposed of by a licensed waste disposal company, by controlled incineration or burial in an approved landfill. Follow all Federal, state and local authorities.

Handling and Storage: Provide adequate ventilation where operating conditions (heating and spraying) may create excessive vapors and mists. Use explosion proof equipment. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when vapor or mist concentrations are high. Wear protective rubber gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. Additional suitable protective clothing may be required depending on working conditions. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water when working with this material. Do not smoke in areas of use.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store material in closed containers in a cool, dry, well ventilated area away from sources of heat, sparks, open flames, and oxidizing agents. Protect containers from physical damage.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Fuel Oil No. 6*, June 2, 1999.
Genium Publishing Corporation, MSDS No. 474: April, 1981.
Dangerous Properties of Industrial Materials, 5th ed., 1979.
Hawley's Condensed Chemical Dictionary, 11th ed., 1987.
The Merk Index, 11th ed., 1989.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.